REMARKS

Claims 12-28 are pending in the present Application. Claims 12 and 18 have been amended to clarify the claimed invention for the Examiner. Support for these amendments can be found in the Specification at Paragraphs [0025], [0026], [0072]-[0076]. Claims 27 and 28 have been amended to correct antecedent basis as discussed in response to the Section 112 rejection, below. Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

Claim Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 27 and 28 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the Examiner alleges that there is insufficient antecedent basis for "fuel cell assemblies" and "the at least one fuel cell assembly" in the claims.

Applicant has amended the claims to provide antecedent basis in claims 27 and 28 for fuel cell "assembly". Further, Applicant has corrected antecedent basis for thermoelectric "layer". In view of the forgoing amendments, Applicant respectfully submit that claims 27 and 28 satisfy 35 U.S.C. § 112.

Claim Rejections Under 35 U.S.C. §§ 102(b) and 103(a)

Claims 12, 16, 17, 27 and 28 stand rejected under 35 U.S.C. § 102(b), as allegedly anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Farkash et al. (US 2001/0036568) as evidenced by Houlberg (US 2004/0137295).

Claims 18, 19, 21, and 24-26 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Farkash et al. (US 2001/0036568) in view of Enjoji et al. (US 2004/0101728). Because the rejections are related, they are addressed together. Applicant respectfully traverses these rejections.

Claim 13 stands rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Farkash et al. (US 2001/0036568) in view of Kaneko (JP 06-318736). Claim 14 stands rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Farkash et al. (US 2001/0036568) in view of Keegan (US 2003/0003339). Claim 15 stands rejected under 35 U.S.C. § 103(a), as

allegedly unpatentable over Farkash et al. (US 2001/0036568) in view of Houlberg (US 2004/0137295). Claim 20 stands rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Farkash et al. (US 2001/0036568) in view of Enjoji et al. (US 2004/0101728) as applied to Claim 18 above, and further in view of Kaneko (JP 06-318736). Claim 22 stands rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Farkash et al. (US 2001/0036568) in view of Enjoji et al. (US 2004/0101728) as applied to Claim 18 above, and further in view of Keegan (US 2003/0003339). Claim 23 stands rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Farkash et al. (US 2001/0036568) in view of Enjoji et al. (US 2004/0101728) as applied to Claim 18 above, and further in view of Houlberg (US 2004/0137295). Applicant respectfully traverses these rejections.

Farkash teaches a fuel cell assembly that includes a fuel cell stack, a heatable element, and a plurality of coolant plates through which a coolant is circulated to cool a fuel cell stack at a generally consistent operating temperature. *See Farkash, para. [0067].* The coolant flow taught in Farkash is described as a liquid, de-ionized water, or other non conducting fluid that absorbs and removes through an inlet and outlet manifold extending through the fuel cell stack. *See Farkash, para. [0091].* In addition to the coolant system, Farkash teaches the use of a heating element that includes a resistive thermal device, which electrically heats the fuel cell assembly . *Id. at para. [0035].*

Kaneko teaches a thin film Peltier thermoelectric element. *See Kaneko, Abstract.*

Keegan teaches a power source such as a battery that provides power to interconnects to heat a fuel cell. In Keegan, the disclosed interconnects act as a heating element to heat up each electrochemical cell to a desired temperature. *See Keegan, para. [0028]-[0029].*

Houlberg teaches resistive heatable elements that are electrically connected to the fuel stack. *See Keegan, para. [0039].*

Enjoji teaches providing a heating mechanism between adjacent fuel cells. *See Enjoji, para. [0063].*

Regarding independent claims 12 and 18, the Office Action asserts, on Page 3 and 7, that the Farkash reference discloses a method of controlling a temperature of a fuel cell comprising measuring the operating temperature of a fuel cell assembly adjacent to a thermoelectric layer(s); and in response to the detected temperature, adjusting a power source to provide power to a

resistive temperature device "254" to maintain plate "208" at a predetermined temperature. In applying Farkash, the Office Action on page 4 and 7 alleges that it is inherent that controlling a power source to provide power to a resistive temperature device comprises adjusting a voltage of a power source to the resistive temperature device to heat or cool the fuel cell assembly in contact with the thermoelectric layer. In other words, the Office Action asserts that increasing a voltage applied to the resistive temperature device in Farkash actively heats the end cell, while decreasing or turning off the voltage of the resistive temperature device passively cools the end wall, and that this reads on claims 12 and 18.

While the Applicant respectfully disagrees with the Examiner's interpretation of previously presented claims 12 and 18, the Applicant has amended claims 12 and 18 to clarify that the thermoelectric layer heats or cools the fuel cell assembly in contact with the thermoelectric layer. Specifically, claims 12 and 18 recite that the temperature of the fuel cell (or fuel cell stack) is controlled by a voltage of a power source that is adjusted in response to the measured temperature to heat or cool the fuel assembly (or assemblies) so as to provide a heat distribution of the fuel cell assembly that is substantially uniform. At most, Farkash discloses that a voltage applied to its resistive temperature device can actively heat a collector plate, while reducing a voltage passively cools the collector plate. Such a device does not actively remove heat from a fuel cell assembly.

Paragraphs [0014] and [0017] of the Applicant's specification states that, in order to perform optimally, fuel cells should be maintained at a certain temperature that is nearly uniform across each cell in the stack. For example, at high temperatures, the catalyst may be destroyed, while at low temperatures, ice may form within the cell assembly. In addition, the catalyst efficiency decreases when the catalyst temperature falls outside an optimal range. Thus, it is important to control the temperature within the fuel cell assembly by either heating or cooling the assembly in order to prevent hot and cold zones that prevent optimal performance of the fuel cell. Therefore, it is important that the thermoelectric layer have the ability to switch back and forth between actively heating and actively cooling the fuel cell assembly during operation of the fuel cell assembly. *See e.g., para. [0063].* Farkash's resistive temperature device simply allows the fuel cell to drop in temperature by allowing accumulated heat to dissipate when the heating element is turned off. Thus, Farkash's fails to disclose adjusting a voltage of a power source in

response to the measured temperature to heat or cool the fuel cell assembly, as claimed.

The Office Action further asserts, on Page 3 and 7, that Farkash provides a uniform temperature along the length of the stack. However, in contrast, claims 12 and 18 recite that the heat distribution of the fuel cell assembly is substantially uniform. In the present claims, the temperature of the fuel cell assembly is maintained at a substantially uniform temperature across each cell in the stack in order to provide optimal operating conditions for the stack. Thus, uniformly providing heat to the cell stack is not the same as maintaining an assembly of a cell stack at a substantially uniform temperature. Farkash thus fails to disclose that the heat distribution of the fuel cell assembly is substantially uniform, as claimed.

Claims 16, 17, 27 and 28 variously depend from claim 12. Because Farkash fails to disclose or suggest the features recited in independent claim 12, dependent claims 16, 17, 27 and 28 are patentable for at least the reasons that claim 12 is patentable.

Further, regarding independent claim 18, the Office Action admits on Pages 7-8 that Farkash does not expressly teach a step of providing one or more thermoelectric layers in between adjacent fuel cell assemblies in the fuel stack, or a step of measuring the start-up temperature of the fuel cell assembly in contact with a thermoelectric layer. The Office Action turns to Enjoji to overcome the deficiencies of Farkash. However, Enjoji fails to disclose or suggest adjusting a voltage of power source in response to the measured temperature to heat or cool at least one fuel assembly; or that the heat distribution of a fuel cell is substantially uniform, as claimed. Thus, Enjoji fails to overcome the deficiencies of Farkash, as discussed above.

Claims 19, 21, and 24-26 variously depend from claims 18. Because the combination of Farkash and Enjoji fail to disclose or suggest the features recited in independent claim 18, dependent claims 19, 21, and 24-26 are patentable for at least the reasons that claim 18 is patentable.

The Office Action further rejects dependent claim 13 under 35 U.S.C. § 103(a), as allegedly unpatentable over Farkash et al. (US 2001/0036568) in view of Kaneko (JP 06-318736). Claim 13 depends from claim 12. The Office Action admits on Page 5 that Farkash does not expressly teach thermoelectric devices that are Peltier devices. The Office action applies Kaneko's disclosure of a method of controlling temperature of a substrate by using a Peltier device. However, Applicant notes that Kaneko fails to disclose or suggest measuring the

operating temperature of a fuel cell assembly in contact with a thermoelectric layer; adjusting a voltage of power source in response to the measured temperature to heat or cool the fuel assembly; or that the heat distribution of a fuel cell is substantially uniform, as claimed. Because the combination of Farkash and Kaneko fails to disclose or suggest the features recited in independent claim 12, dependent claim 13 is allowable for at least the reasons that claim 12 is allowable. Additionally, Applicant notes that Farkash teaches use of a coolant to remove heat.

The Office Action further rejects dependent claim 14 under 35 U.S.C. § 103(a), as allegedly unpatentable over Farkash et al. (US 2001/0036568) in view of in view of Keegan (US 2003/0003339). Claim 14 depends from claim 12. The O.A. admits on Page 5 that Farkash does not expressly teach a power source that is a battery. However, Applicant notes that Keegan fails to disclose or suggest measuring the operating temperature of a fuel cell assembly in contact with a thermoelectric layer; adjusting a voltage of power source in response to the measured temperature to heat or cool the fuel assembly; or that the heat distribution of a fuel cell is substantially uniform, as claimed. Because the combination of Farkash and Keegan fails to disclose or suggest the features recited in independent claim 12, dependent claim 14 is allowable for at least the reasons that claim 12 is allowable.

The Office Action further rejects dependent claim 15 under 35 U.S.C. § 103(a), as allegedly unpatentable over Farkash et al. (US 2001/0036568) in view of in view of in view of Houlberg (US 2004/0137295). Claim 15 depends from claim 12. The O.A. admits on Page 6 that Farkash does not expressly teach a power source that is a fuel cell assembly. However, Applicant notes that Houlberg fails to disclose or suggest measuring the operating temperature of a fuel cell assembly in contact with a thermoelectric layer; adjusting a voltage of power source in response to the measured temperature to heat or cool the fuel assembly; or that the heat distribution of a fuel cell is substantially uniform, as claimed. Because the combination of Farkash and Houlberg fails to disclose or suggest the features recited in independent claim 12, dependent claim 15 is allowable for at least the reasons that claim 12 is allowable.

The Office Action further rejects dependent claim 20 under 35 U.S.C. § 103(a), as allegedly unpatentable over Farkash et al. (US 2001/0036568) in view of Enjoji et al. (US 2004/0101728) as applied to Claim 18 above, and further in view of Kaneko (JP 06-318736). Claim 20 depends from claim 18. Applicant notes that Enjoji and Kaneko also fails to disclose

or suggest adjusting a voltage of power source in response to the measured temperature to heat or cool the temperature of the at least one fuel assembly; or that the heat distribution of a fuel cell is substantially uniform. Because the combination of Farkash and Enjoji and Kaneko fails to disclose or suggest the features recited in independent claim 18, dependent claim 20 is allowable for at least the reasons that claim 18 is allowable.

The Office Action further rejects dependent claim 22 under 35 U.S.C. § 103(a), as allegedly unpatentable over Farkash et al. (US 2001/0036568) in view of Enjoji et al. (US 2004/0101728) as applied to Claim 18 above, and further in view of Keegan (US 2003/0003339). Claim 22 depends from claim 18. Applicant notes that Enjoji and Keegan also fails to disclose or suggest adjusting a voltage of power source in response to the measured temperature to heat or cool the temperature of the at least one fuel assembly; or that the heat distribution of a fuel cell is substantially uniform. Because the combination of Farkash and Enjoji and Keegan fails to disclose or suggest the features recited in independent claim 18, dependent claim 22 is allowable for at least the reasons that claim 18 is allowable.

The Office Action further rejects dependent claim 23 under 35 U.S.C. § 103(a), as allegedly unpatentable over Farkash et al. (US 2001/0036568) in view of Enjoji et al. (US 2004/0101728) as applied to Claim 18 above, and further in view of Houlberg (US 2004/0137295). Claim 23 depends from claim 18. Applicant notes that Enjoji and Houlberg also fails to disclose or suggest adjusting a voltage of the power source in response to the measured temperatures to heat or cool the temperature of the at least one fuel assembly; or that the heat distribution of a fuel cell is substantially uniform. Because the combination of Farkash and Enjoji and Houlberg fails to disclose or suggest the features recited in independent claim 18, dependent claim 23 is allowable for at least the reasons that claim 18 is allowable.

It is believed that the foregoing remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicant. Accordingly, reconsideration and withdrawal of the rejection(s) and allowance of the case are respectfully requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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